WHAT IS CLAIMED IS:

1. An apparatus for treating substrate surfaces, comprising:

a lamp house located over a substrate transfer path and face to face with a treating surface of a substrate being transferred along said transfer path by a conveyer means;

a dielectric barrier discharge lamp fixedly mounted in said lamp house to irradiate ultravilot light toward said substrate; and

a moistened inert gas generating means adapted to supply a water vapor-containing moistened inert gas to a space between said substrate and said dielectric barrier discharge lamp;

producing a reducing active member [H·] and an oxidative active member [·OH] by irradiating said moistened inert gas with ultraviolet light from said dielectric barrier discharge lamp.

2. An apparatus for treating substrate surfaces as defined in claim 1, wherein said substrate is a plate of glass, synthetic resin, ceramics or metal, or a composite plate of such materials.

3. An apparatus for treating substrate surfaces as defined in claim 1, wherein said moistened inert gas is a mixed fluid of pure water vapor and nitrogen gas.

4. An apparatus for treating substrate surfaces as defined in claim 1, wherein said lamp house is provided within a chamber holding a moistened

inert gas atmosphere therein, and provided with entrance and exit openings at upstream and downstream ends thereof for said substrate.

5. An apparatus for treating substrate surfaces as defined in claim 4, wherein said chamber is adapted to hold a substantially oxygen-free atmosphere therein.

6. An apparatus for treating substrate surfaces as defined in claim 4, wherein said conveyer means is constituted by a roller conveyerextending into and across said chamber.

7. An apparatus for treating substrate surfaces as defined in claim 6, wherein said chamber includes a partition plate located beneath a substrate transfer surface of said roller conveyer and out of contact with said substrate, said partition plate being provided with slots to receive top portions of rollers of said roller conveyer to be brought into abutting engagement with said substrate.

8. An apparatus for treating substrate surfaces as defined in claim 7, wherein said partition plate is constituted by a heater plate.

9. An apparatus for treating substrate surfaces as defined in claim 4, wherein said lamp house is opened into said chamber, and an inert gas feed means is connected to said lamp house.

10. An apparatus for treating substrate surfaces as defined in claim 9, wherein said inert gas feed means is constituted by an inert gas feed pipe connected to a top side of said lamp house, and a reflector plate is provided over said dielectric barrier discharge lamp in said lamp house to reflect upward components of said ultraviolet light, said reflector plate being so located as to divide said lamp house into an upper room in communication with said inert gas feed pipe and a lower room accommodating said dielectric barrier discharge lamp, said reflector plate containing void portions to circulate said inert gas from said upper room to said lower room.

11. An apparatus for treating substrate surfaces as defined in claim 9, wherein said moistened inert gas generating means includes a moistened inert gas feed means connected to said chamber and adapted to supply a water vapor-containing moistened inert gas toward said treating surface of said substrate.

12. An apparatus for treating substrate surfaces as defined in claim 11, wherein said moistened inert gas feed means is adapted to supply said moistened inert gas toward a position forward of said substrate advancing toward the said lamp house.

13. An apparatus for treating substrate surfaces as defined in claim 10, wherein said inert gas feed means is adapted to supply said inert gas to

said lamp house under a higher pressure than said moistened inert gas supplied by said moistened inert gas feed means.

14. An apparatus for treating substrate surfaces as defined in claim 10, wherein said moistened inert gas feed means is constituted by a pure water tank, and a nitrogen gas feed pipe having a multitude of fine gas blow holes in a fore end portion which is submerged in said pure water tank to generate a moistened inert gas.

15. An apparatus for treating substrate surfaces as defined in claim 14, further comprising a moistened inert gas induction pipe connecting said pure water tank to a mixing container to adjust concentration of water vapor in said moistened inert gas from said pure water tank, said mixing container being connected to said chamber through said moistened inert gas feed pipe.

16. An apparatus for treating substrate surfaces as defined in claim 15, further comprising an exhaust pipe connected to said chamber.

17. An apparatus for treating substrate surfaces as defined in claim 4, wherein said moistened inert gas generating means is constituted by a pure water vessel, which pure water vessel being open at a top end located face to face with said lamp house and adapted to hold pure water therein, and an inert gas feed means located in said pure water vessel and provided with a multitude of inert gas blow holes.

18. An apparatus for treating substrate surfaces as defined in claim 17, wherein a roller conveyer of said substrate conveyer means is located acrosss said chamber, and said pure water vessel is located on the lower side of said roller conveyer.

19. An apparatus for treating substrate surfaces as defined in claim 17, wherein said lamp house is opened toward a front surface of said substrate being transferred along said path of transfer, and said inert gas feed means is connected to said lamp house.

20. An apparatus for treating substrate surfaces as defined in claim 17, wherein said inert gas feed means includes an inert gas feed pipe immersed in pure water in said pure water vessel and provided with a multitude of gas blow holes.

21. An apparatus for treating substrate surfaces as defined in claim 17, further comprising a water feed pipe connected to said pure water vessel at one end thereof, and an overflow type water discharge pipe opened at a predetermined height of said pure water vessel.

22. An apparatus for treating substrate surfaces as defined in claim 21, wherein the other end of said water feed pipe is connected to a water tank located in a higher position than said pure water vessel.

23. An apparatus for treating substrate surfaces as defined in claim 17, further comprising an exhaust pipe connected at one end to said chamber and at the other end to a suction side of a pump, the delivery side of which pump being connected to said inert gas feed means.

24. An apparatus for treating substrate surfaces as defined in claim 4, wherein said lamp house is hermetically closed by an ultraviolet light transmitting window provided on a side facing toward said substrate.

25. An apparatus for treating substrate surfaces as defined in claim 24, wherein said window is paned with quartz glass.

26. An apparatus for treating substrate surfaces as defined in claim 9, wherein said lamp house is provided with a partition member of a predetermined thickness on a side facing toward said substrate, said partition member being provided with a multitude of fine holes across said thickness, and a reflecting film coated on entire surfaces of said partition member including inner surfaces of said fine holes.

27. An apparatus for treating substrate surfaces as defined in claim 1, wherein inner surfaces of said lamp house is coated with a reflecting film to reflect off ultraviolt light.

28. A method for treating substrate surfaces, comprising the steps of:

placing a substrate in a mixed atmosphere of an inert gas and water vapor under irradiation of ultraviolet light from a dielectric barrier discharge lamp, thereby splitting water vapor into a reducing active member [H·] and an oxidative active member [·OH]; and

letting said reducing and oxidative active members [H·] and [·OH] contact with a surface of said substrate to be treated.

29. A method for treating substrate surfaces, comprising the steps of :

horizontally transferring a substrate into a mixed atmosphere of an inert gas and water vapor under irradiation of ultraviolet light from a dielectric barrier discharge lamp, thereby decomposing organic substances deposited on a surface of said substrate and at the same time splitting water vapor into a reducing active member [H·] and an oxidative active member [·OH]; and

subjecting said reducing and oxidative active members [H·] and [·OH] to reactions with decomposition products of said organic substances.

30. A method for treating substrate surfaces, comprising the steps of :

horizontally transferring a substrate into a mixed atmosphere of an inert gas and water vapor under irradiation of ultraviolet light from a dielectric barrier discharge lamp, thereby decomposing organic substances deposited on a surface of said substrate and at the same time splitting water vapor into a reducing active member [H·] and an oxidative active member

[·OH];

dry-washing and minimizing contact angle of a surface of said substrate by subjecting said reducing and oxidative active members [H·] and [·OH] to reactions with decomposition products of said organic substances;

wet-washing siad substrate by supplying a wash liquid thereto; and

drying said substrate.